STATE OF ILLINOIS
ILLINOIS COMMERCE COMMISSION

COMMONWELATH EDISON COMPANY	)	
	)	07-0540
	)	
Approval of the Energy Efficiency and	)	
Demand-Response Plan Pursuant to Section	)	
12-103(f) of the Public Utilities Act	)	

TESTIMONY OF CHRISTOPHER C. THOMAS
ON BEHALF OF THE CITIZENS UTILITY BOARD

CUB Exhibit 1.0

December 14, 2007

ICC DOCKET NO. 07-0540

DIRECT TESTIMONY OF CHRISTOPHER C. THOMAS

TABLE OF CONTENTS

Exhibits

I. STATEMENT OF QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Christopher C. Thomas. My business address is 208 S. LaSalle Street, Suite 1760, Chicago, IL 60604-1003.

Q. WHAT IS YOUR PRESENT OCCUPATION?

A. I am employed by the Citizens Utility Board ("CUB") as the Director of Policy. My duties include development of CUB's policy positions, filing expert testimony before the Illinois Commerce Commission ("ICC" or "Commission") on CUB's behalf, and management of the Policy Department. My responsibilities also include serving as CUB's voting representative to the PJM member committee and working to develop consumer sector positions within the MISO Advisory Committee.

Q. PLEASE SUMMARIZE YOUR PROFESSIONAL EXPERIENCE.

A. My professional career includes eight years as a utility regulatory economist. I started my career as a regulatory economist in the Telecommunications Department of the Missouri Public Service Commission ("MoPSC"). While with the MoPSC, I filed testimony or affidavits in 11 different dockets. I became a CUB employee in September 2004, and have filed testimony before the ICC in numerous dockets. CUB Exhibit 1.01, attached to this testimony, is a list of the dockets in which I have filed testimony and a brief description of the nature of each docket.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A. I have a Bachelor's degree in Business Administration with a concentration in Finance and a minor in Economics from Truman State University, and a Master's degree in Economics and Finance from Southern Illinois University, Edwardsville.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to address the expansion of the Nature First program that Commonwealth Edison Company ("ComEd" or "the Company") has proposed to meet the demand response standards of Section 12-103(c) of the Public Utilities Act ("PUA" or "the Act"). This Section requires electric utilities to implement "cost-effective demand response measures to reduce peak demand by 0.1% over the prior year for eligible retail customers." 220 ILCS 5/12-103(c). There are two general problems with the Company's plan and supporting testimony:

1) Cost estimates provided for the Nature First expansion, which ComEd used to develop the revenue requirement that it proposes to recover through Rider EDA, appear to be inflated.

2) Rider EDA does not appear to include all offsetting revenues that ComEd could receive from the PJM Interconnection LLC ("PJM"), energy markets.

Q. WHAT IS COMED'S NATURE FIRST PROGRAM?

A. Nature First is an air conditioner cycling program for residential customers with central air conditioning units. Essentially, ComEd installs a radio-controlled switch on the compressor of each participant's central air conditioner. This switch allows ComEd to turn the compressor on and off during for short periods of time on peak summer days (commonly referred to as cycling). In return, customers receive bill credits for participating in the program, depending on their level of participation, which are funded by revenues from the PJM administered wholesale markets. Cycling air conditioners reduces load during peak times and acts as a relief valve against stress on the distribution system. Using an air conditioner cycling program to reduce demand during peak times also reduces electricity prices.

Q. ARE YOU CONCERNED ABOUT THE IMPACT THAT DIRECT LOAD CONTROL WILL HAVE ON CUSTOMER COMFORT?

A. Of course. Customer comfort is one of CUB's foremost concerns. However, studies have found that direct load control can achieve significant peak load reductions without moving outside of the comfort zones established by the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) basic comfort guidelines. See CUB Exhibit 1.02 (Good Sense presentation, Slide 6); CUB Exhibit 1.03 (Jason Black Paper, Figure 5). These studies show that a cycling program may impact temperature levels within a structure by 1 to 3 degrees, well within the ASHRE guidelines. *Id.*

III. COMED'S NATURE FIRST EXPANSION COST ESTIMATES APPEAR TO BE INFLATED

Q. WHAT PROBLEMS HAVE YOU IDENTIFIED WITH COMED'S PROPOSED COSTS TO EXPAND THE NATURE FIRST PROGRAM?

A. There are two problems with the cost estimates presented by Mr. Eber:

1) The proposed one-time operation and maintenance ("O&M") promotional cost to acquire new Nature First customers would allow the company to over-recover its costs.

2) Mr. Eber inappropriately escalates O&M expenses by 2.5% to adjust for inflation, without considering productivity gains.

Q. WHAT IS THE ONE-TIME O&M PROMOTIONAL COST?

A. According to Mr. Eber, one-time O&M costs include a one-time promotional cost of $80 per participant. Mr. Eber goes on to say:

> ComEd plans to expand the Nature First program to the level required to meet the statutory goals by increasing promotion of the program and outreach to customers. As we have done in the past, ComEd will continue to use demographic information to send direct mailings that specifically target those customers likely to have the correct home configuration for the program. ComEd Ex. 3.0 at L. 165-169.

Q. WHAT PROBLEMS HAVE YOU IDENTIFIED WITH THE PROPOSED ONE-TIME O&M PROMOTIONAL COST?

A. There are two problems. First, it seems excessive. According to ComEd Ex. 3.1, using this assumed $80.00 per customer, total promotional costs would equal $647,334 in 2008, $630,975 in 2009, and $579,585 in 2010. This is a huge promotional campaign, well in excess of the "direct mailings that specifically target those customers likely to have the correct home configuration for the program" which Mr. Eber discusses. The company is proposing to sign-up between 6,900 and 8,100 customers per year. Based on the generous cost estimate of $1.00 per mailing, this equates to a 1.20 to 1.25% return rate, which is far lower than the company should reasonably expect. As I will discuss below, it is reasonable to expect many more customers to be interested in signing up for the program. When asked to support this estimate in CUB Discovery Request 1.19 (CUB Ex. 1.04), the company responded that the estimate is based on "ongoing confidential negotiations." Clearly, more detail is needed to support this cost. The Commission cannot ensure that rates are just and reasonable if the Company's only basis for those rates is a secret negotiation. ComEd's rebuttal testimony must rectify this issue.

Second, ComEd proposes to recover the $80.00 promotional cost from every customer that signs up for the program. Thus, if ComEd is successful, and signs up more than the targeted number of new Nature First customers, it will recover $80.00 for each customer over its target, even though it did not incur any additional cost to acquire them. To rectify this, the Commission must limit the recovery of the one-time promotional O&M cost to only the number of customers targeted by ComEd's marketing efforts.

Q. IS IT REASONABLE TO EXPECT THAT COMED MAY EXCEED ITS PROJECTED TARGETS FOR THE NATURE FIRST EXPANSION?

A. Yes. In its energy efficiency and demand response filing, the Ameren Illinois Utilities have proposed a residential demand response program similar to ComEd's Nature First program. Ameren's filing indicates that "[a] customer hit rate of 7 to 10% is considered typical." Docket No. 07-0539, Ameren Ex. 2.1 at 102.

ComEd's current Nature First program only has approximately 57,000 Customers (ComEd Ex. 3.0 at L. 148), or approximately 1.7% of ComEd's 3.4 million residential customers. It is reasonable to expect that, with the promotional activity that ComEd has proposed, there may be as many as 180,000 additional customers willing to sign up for the program ((7% - 1.7%)* 3.4 million customers). Such an outcome seems entirely likely, given the recent focus on energy rates and the bill credits that customers can receive by signing up for Nature First.

Q. WHY IS IT INAPPROPRIATE TO INCLUDE INFLATION IN THE O&M COST ESTIMATES?

A. Mr. Eber's proposed O&M costs include an inflation escalation factor of 2.5% for both "One Time O&M Promotional Costs" and "Annual Ongoing O&M Cost for IT and Switch Maintenance and Repair." ComEd Ex. 3.1. This is inappropriate because it increases costs without similarly recognizing the cost savings that the company will undoubtedly receive from productivity gains. According to the Bureau of Labor Statistics most recent release of "Productivity and Cost By Industry: Selected Service-Providing and Mining Industries, 2005," unit labor costs for power generation and supply utilities (NAICS number 2211 - which I understand to include electric power generation, transmission and distribution functions) actually fell by 3.7% between 2004 and 2005. The Commission cannot include cost increases in a rider without the offsetting symmetric cost savings that occur through productivity gains. Collecting the costs of the program through the rider, with an annual true-up, assures that the company will already be recovering inflation, offset by productivity. Thus, including ComEd's proposed one-sided inflation adjustment will lead to over-recovery of costs.

IV. RIDER EDA DOES NOT INCLUDE ALL OFFSETTING REVENUES THAT COMED COULD RECEIVE FROM PJM ENERGY AND CAPACITY MARKETS

Q. HOW DOES RIDER EDA FAIL TO INCLUDE ALL OFFSETTING REVENUES FROM PJM?

A. Mr. Crumrine's testimony (ComEd Ex. 5.0 at L. 195-198) discusses how ComEd's Rider EDA Cost Recovery Tariff (Appendix F to ComEd Ex. 1.0) includes the PJM revenues from the incremental expansion of the Nature First Program. However, it is not clear from ComEd's filing that the company intends to maximize the revenue it receives from PJM to the benefit of customers.

Q. WHAT EVIDENCE IS THERE THAT COMED DOES NOT INTEND TO MAXIMIZE REVENUES FROM PJM?

A. In his testimony, Mr. Eber states:

> Q. Should the fact that Nature First is not dispatched every year affect whether ComEd uses the program to meet its statutory goals of a 0.1% reduction in peak demand per year?
>
> A. No. Calling the program unnecessarily during the summer would drive up the marginal costs of the program. It is likely that increasing the number of times the Nature First Program participants are called during a summer would decrease customers' willingness to participate in the program for the amount of incentive currently provided and

> increase the churn rate of program participants. ComEd Ex. 3.0 L. 199-210.

Mr. Eber's answer indicates that ComEd will not attempt to maximize energy market revenues by self-scheduling Nature First load reductions.

Q. WHAT DO YOU MEAN BY ENERGY MARKET REVENUES?

A. Energy market revenues are revenues that ComEd could receive from PJM's economic demand response program by cycling switches. This is explained in more detail in ComEd's Response to CUB Discovery Request 1.09:

> In 2007, ComEd enrolled Nature First in both PJM's capacity program and PJM's economic demand response program. The economic demand response program allows ComEd to self-schedule demand response events and provides for energy payments. The energy payments for the maximum number of events allowed under Rider AC7 in 2007 (i.e., 20 events) are estimated in the attached spreadsheet (CUB 1.09_Attach 1). In preparing the attached spreadsheet, ComEd used the hottest twenty summer weekdays. The estimated energy payment from PJM if the Nature First Program were called for the maximum number of events in 2007 would have been $527,308.
> CUB Ex. 1.05, ComEd Response to CUB 1.09.

ComEd's data response shows that, in 2007, ComEd could have received approximately $10.41 per kW of capacity if it had called the program during the hottest twenty summer weekdays. ($10.41 = $527,308 / 54,977 kW of capacity). This means that failing to use the program during the summer would forego more that $100,000 in annual revenue that could be used to offset the cost of the program. Multiplying ComEd's program targets by $10.41 per kW equates to approximately $121,817 in energy revenue in 2008, $115,842 in 2009, and $103,818 in 2010. This revenue will vary each year as energy prices change, but represents a significant amount of ComEd's total annual revenue requirement for the program. For example, in 2010, when costs are highest and revenues are lowest, estimated energy revenues of $103,818 would equate to 8.79 % of the $1,180,787 total revenue requirement billed to customers. ComEd Ex. 3.1 (revenue requirement).

Q. WHAT SHOULD THE COMMISSION DO TO REMEDY THIS PROBLEM?

A. The Commission should order ComEd to schedule demand response events for Nature First to maximize energy revenues. The Company faces two problems that must be recognized. First, ComEd cannot know exactly when the hottest 20 days will occur. Second, the program must be available whenever PJM calls a reliability event. The Company should use its best judgment in scheduling events to balance PJM's need for program availability and its best estimates of the timing of the hottest days of the year, while striving to maximize the energy revenues received from the PJM energy markets.

Q. HOW DO YOU ADDRESS MR. EBER'S CONCERNS THAT CALLING THE PROGRAM UNNECESSARILY WOULD DRIVE UP PROGRAM COSTS AND DECREASE CUSTOMERS' WILLINGNESS TO PARTICIPATE?

A. ComEd has not sufficiently supported these concerns. In discovery, we asked ComEd to provide all documents and studies supporting these statements, and the company was unable to do so. See CUB Ex. 1.06, ComEd Response to CUB DR 1.13 and CUB Ex. 1.07, ComEd Response to CUB DR 1.15. Accordingly, these unsupported assertions should not prevent the Commission from returning the large potential revenues available to offset the cost of the program to customers.

V. CONCLUSION

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. ComEd's estimate of the cost of the Nature First expansion, which ComEd proposes to recover through Rider EDA, appears to be inflated. The proposed one-time operation and maintenance ("O&M") promotional cost to acquire new Nature First customers would allow the company to over-recover its costs, and ComEd inappropriately escalates O&M expenses by 2.5% to adjust for inflation, without considering productivity gains. In addition, Rider EDA does not appear to include all offsetting revenues that ComEd could receive from the PJM Interconnection LLC ("PJM"), energy market. These problems should be fixed to ensure that Illinois customers receive the maximum value from the Nature First expansion proposed in this docket.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes.

Docket Summary for Christopher C. Thomas

Illinois Commerce Commission Docket No.07-528
Commonwealth Edison Company, Petition for Approval of Initial Procurement Plan
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No.07-527
Central Illinois Light Company, d/b/a Ameren CILCO; Central Illinois Public Service Company, d/b/a Illinois Public Service Company, d/b/a Ameren CIPS; and Illinois Power Company, d/b/a AmerenIP, Petition for Approval of Initial Procurement Plan
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No.07-0242 (cons.)
North Shore Gas Company and Peoples Gas Light and Coke Company Proposed general increase in natural gas rates
On Behalf of: The Citizens Utility Board and the City of Chicago

Illinois Commerce Commission Docket No.07-0166
Commonwealth Edison Company Investigation pursuant to Section 9-250 of the Public Utilities Act of Rate Design
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No.07-0165
Central Illinois Light Company, d/b/a Ameren CILCO; Central Illinois Public Service Company, d/b/a Illinois Public Service Company, d/b/a Ameren CIPS; and Illinois Power Company, d/b/a AmerenIP Investigation pursuant to Section 9-250 of the Public Utilities Act of Electric Rate Design
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No.06-0800
Investigation of Rider CPP of Commonwealth Edison Company, and Rider MV of Central Illinois Light Company d/b/a AmerenCILCO, of Central Illinois Public Service Company d/b/a AmerenCIPS, and of Illinois Power Company d/b/a AmerenIP, pursuant to Commission Orders regarding the Illinois Auction
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No. 06-0691 (cons.)
Central Illinois Light Company d/b/a AmerenCILCO, Central Illinois Public Service Company, d/b/a Ameren CIPS, Illinois Power Company d/b/a AmerenIP, Proposal to establish a new rider entitled Rider PRP – Price Response Program, (tariffs filed September 29, 2006)
On Behalf of: The Citizens Utility Board

Docket Summary for Christopher C. Thomas

Illinois Commerce Commission Docket No. 06-0617
Commonwealth Edison Company Proposed Revisions to Rate BES-H Basic Electric Service Hourly Energy Pricing
On Behalf of: The Citizens Utility Board and The City of Chicago

Illinois Commerce Commission Docket No. 06-0379
Citizen's Utility Board And the People of the State of Illinois Petition To Initiate Rulemaking With Notice and Comment for Approval of Certain Amendments to Illinois Administrative Code Part 280.
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No. 06-0270
COMMONWEALTH EDISON COMPANY Petition of Commonwealth Edison Company For Approval Pursuant to Section 7-102 of the Public Utilities Act of the Entry into Certain Contracts Relating to Wind Generation and Approval Under Section 9-201 of a Tariff Concerning the Governor's Sustainable Energy Plan and the Illinois Commerce Commission's Resolution in Docket No. 05-0437.
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No. 06-0070 (cons.)
CENTRAL ILLINOIS LIGHT COMPANY, d/b/a Ameren CILCO, CENTRAL ILLINOIS PUBLIC SERVICES COMPANY, d/b/a AmerenCIPS, and ILLINOIS POWER COMPANY, d/b/a AmerenIP Proposed General Increase For Delivery Services
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No. 06-0027
Illinois Commerce Commission Vs. Illinois Bell Telephone Company - Investigation of specified tariffs declaring certain services to be competitive Telecommunications services.
On Behalf of: The Citizens Utility Board

Illinois Commerce Commission Docket No. 05-0597
Commonwealth Edison Company Proposed general increase in electric rates, general restructuring of rates, price unbundling of bundled service rates, and revision of other terms and conditions of service.
Testimony On Behalf of: The Citizens Utility Board and The City of Chicago

Illinois Commerce Commission Docket No. 04-0779
Nicor Inc. Proposed General Increase in Rates
Testimony On Behalf of: The Citizens Utility Board and the Cook County States Attorney

Docket Summary for Christopher C. Thomas

Illinois Commerce Commission Docket No. 04-0476
Illinois Power Company and Ameren Corp Proposed General Increase in Gas Rates
On Behalf of: The Citizens Utility Board

Missouri Public Service Commission Docket No. TR-2002-251
In the Matter of the Tariffs Filed by Sprint Missouri, Inc., d/b/a Sprint, to Reduce the Basic Rates by the Change in the CPI-TS as Required by Section 392.245(4), Updating Its Maximum Allowable Prices for Non-basic Services and Adjusting Certain Rates as Allowed by Section 392.245(11), and Reducing Certain Switched Access Rates and Rebalancing to Local Rates, as Allowed by Section 392.245(9) (Affidavit)
On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. TO-2004-0207
In the Matter of a Commission Inquiry into the Possibility of Impairment without Unbundled Local Circuit Switching When Serving the Mass Market
On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. IT-2004-0015
In the Matter of Southwestern Bell Telephone Company, d/b/a SBC Missouri's Proposed Revised Tariff Sheet Intended to Increase by Eight Percent the Rates for Line Status Verification and Busy Line Interrupt as Authorized by Section 392.245, RSMo, the Price Cap Statute
On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. TT-2002-472/473
In the Matter of Southwestern Bell Telephone Company's Tariff Filing to Initiate Residential Customer Winback Promotion / In the Matter of Southwestern Bell Telephone Company's Tariff Filing to Extend Business Customer Winback Promotions
On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. TO-2002-222
In the Matter of the Petition of MCImetro Access Transmission Services LLC, Brooks Fiber Communications of Missouri, Inc., and MCI WorldCom Communications, Inc., for Arbitration of an Interconnection Agreement With Southwestern Bell Telephone Company Under the Telecommunications Act of 1996.
On Behalf of: Staff of the Missouri Public Service Commission

Docket Summary for Christopher C. Thomas

Missouri Public Service Commission Docket No. TA-2001-475/TA-99-47
In the Matter of the Application of Southwestern Bell Communications Services, Inc., d/b/a SBC Long Distance, for a Certificate of Service Authority to Provide Interexchange Telecommunications Services within the State of Missouri / In the Matter of the Application of Southwestern Bell Communications Services, Inc., d/b/a Southwestern Bell Long-distance, for a Certificate of Service Authority to Provide Interexchange Telecommunications Services within the State of Missouri.

On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. TO-2001-455
In the Matter of the Application of AT&T Communications of the Southwest, Inc., TCG St. Louis, Inc., and TCG Kansas City, Inc., for Compulsory Arbitration of Unresolved Issues With Southwestern Bell Telephone Company pursuant to Section 252(b) of the Telecommunications Act of 1996

On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. TO-2001-439
In the Matter of the Determining of Prices, Terms and Conditions of Conditioning for xDSL-capable Loops

On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. TT-2001-298
In the Matter of Southwestern Bell Telephone Company's Proposed Tariff PSC Mo. No. 42 Local Access Service Tariff, Regarding Physical and Virtual Collocation

On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. TT-2000-527/513
In the Matter of the Application of Allegiance Telecom of Missouri, Inc., CCMO, Inc. d/b/a Connect!, DSLnet Communications, LLC, KMC Telecom III, Inc. and New Edge Network, Inc. for an Order Requiring Southwestern Bell Telephone Company to File a Collocation Tariff / In the Matter of the Joint Petition of Birch Telecom of Missouri, Inc. for a Generic Proceeding to Establish a Southwestern Bell Telephone Company Collocation Tariff Before the Missouri Public Service Commission

On Behalf of: Staff of the Missouri Public Service Commission

Missouri Public Service Commission Docket No. TO-98-329 In the Matter of an Investigation into Various Issues Related to the Missouri Universal Service Fund

On Behalf of: Staff of the Missouri Public Service Commission

GoodCents

Demand Response Programs

New Considerations, Choices, & Opportunities

An Illustrative GoodCents *Direct* Program Design

A/C Cycling During Control Event

Expected Number of Control Hours 150
Expected Number of Control Events 50

Cycling Option	Minutes Off	Minutes On	% of Time A/C Off	Change in Customer's Comfort Level	kW Demand Response	Annual Incentive Payment
1	6.00	24.00	20.00%	No Noticeable Change	0.40	$6.00
2	7.50	22.50	25.00%	No Noticeable Change Likely	0.50	$7.50
3	10.00	20.00	33.33%	1° Change in Temperature	0.80	$12.00
4	15.00	15.00	50.00%	2° Change in Temperature	1.20	$18.00
5	20.00	10.00	66.67%	3° Change in Temperature	1.60	$24.00
6	22.50	7.50	75.00%	4° Change in Temperature	1.75	$26.25
7	24.00	6.00	80.00%	5° Change in Temperature	1.90	$28.50

Example Control Periods

Winter:	5:00 a.m. to 7:00 a.m.	7:00 a.m. to 9:00 a.m.	8:00 p.m. to 10:00 p.m.
Summer:	2:00 p.m. to 4:00 p.m.	4:00 p.m. to 6:00 p.m.	6:00 p.m. to 8:00 p.m.

Control Event "Opt-Outs" per Year = 3

GoodCents

Demand Response as a Substitute for Electric Power System Infrastructure Investments

Jason W Black (jwblack@mit.edu)
Massachusetts Institute of Technology

Abstract – This paper investigates the system-wide implications of regulatory policies to promote demand response as a substitute for investments in system capacity (generation, transmission, and distribution). Investments in demand response technologies, such as smart thermostats for thermal energy storage, have the potential to improve the efficiency of operations and investments in the electric power system. Reducing the magnitude of demand fluctuations will allow the utilization of the generation, transmission, and distribution systems to be increased and the levels of ancillary voltage and frequency support and reserves reduced. An analysis of the long term effects of demand response on electricity pricing and generation investment is modeled. This analysis enables a general comparison of the potential for avoided costs in generation, transmission, and distribution that could be expected from active regulatory support of demand response investments.

Introduction

This paper investigates the potential for demand response to provide a substitute for capacity investments. Large scale implementation of demand response is modeled to determine the potential impact on capacity investments. The paper focuses on demand response at the residential level, which is typically discounted in terms of its potential size and perceived cost effectiveness. This paper attempts to present a case for the potential for residential demand response. Section 1 of the paper outlines the potential of demand response to reduce peak loads via thermal storage or load shifting. Section 2 contains an example illustrating the potential for thermal storage. Section 3 briefly explores the issues associated with implementing large scale demand response. Section 4 presents the results from simulations to determine the effects of large scale demand response on long term generation capacity. Section 5 illustrates the potential for demand response to substitute for investments in transmission capacity. Section 6 gives a brief overview of secondary benefits from demand response. Section 7 explores areas for future research.

I. Potential for Thermal Storage and Load Shifting

Innovations in control and communications technologies enable the creation of relatively low cost demand response schemes. A significant portion of peak demand can be shifted using these technologies given the proper regulatory and market structures. Past studies of the potential for demand response typically involved studies of consumer reaction to real time or time of use pricing without including the technologies to facilitate demand response. Several utilities currently have successful demand response programs that demonstrate the potential for peak shaving. The majority of these programs focus on large consumers. There is significant potential for peak shaving amongst smaller, residential consumers, however, that could be realized with the proper incentive schemes.

Electricity demand is indirect demand. Consumers do not actually demand electricity itself, but the services provided by equipment that uses electricity. Electricity demand can be differentiated by demand for power and demand for energy. Demand for power is instantaneous, while demand for energy is not. Energy based demand can be utilized as a storage mechanism for electric power. In addition, the services provided by equipment which demands power rather than energy are not time dependent in many cases.

A sub category of power demand consists of deferrable load. Washers, dryers, dishwashers, and possibly electric ovens are examples of appliances that have deferrable load. Consumers often are not concerned with the exact times that such appliances run, as long as it is within a certain interval. This presents an opportunity for deferring the power consumption by these appliances from peak to off peak time periods – especially if programmable controls are available to automate the deferral. Although these appliances typically make up a small portion of the total residential load due to their intermittent usage, they do consume significant amounts of power while running and therefore offer the potential for significant peak shaving whenever they can be shifted to off peak consumption.

Energy Based load consists of air conditioners, refrigerators, water heaters, and electric space heaters. These provide service based on thermal transfer (heat or cooling). As such, consumers are indifferent to the actual time that this equipment runs, as long as the temperature remains within a certain range. By intelligently controlling consumption, the desired temperature range can be utilized as a thermal storage medium, and therefore as an indirect electricity storage method.

Energy based load accounts for nearly 50% of total household consumption. This represents a very large potential for load shifting in order to reduce peak demand by utilizing thermal storage. Air conditioning accounts for over 20% of household electricity usage in the United States. Air conditioning load is also highly peak coincident, since summer peaks are almost entirely caused by air conditioning load. "Residential and commercial air conditioning load represent at least 30% of the summer peak electricity loads". [2]

Refrigeration accounts for over 10% of household electricity usage [2]. The load pattern of a refrigerator involves cycling over short time periods, on the order of minutes, which is relatively smooth between hours. This load profile is a result of the thermal characteristics of refrigerators and the desire for minimizing temperature deviations.

The storage time for a refrigerator is therefore too short to adequately allow for inter-hour load shifting. It is possible, however, to utilize for short term load reductions such as frequency control or possibly for VAR compensation. Refrigerators may also be integrated into protections schemes – they could "trip" much like circuit breakers in response to voltage sags and prevent higher level outages.

Thermal storage programs typically involve the use of chillers to create ice during off-peak hours that is then melted during peak hours to offset air conditioning load. [8] Chillers are installed only at larger load sources due to costs and economies of scale. Although it is possible that this technology could be expanded to the mass consumer market, it would involve the installation of significant equipment at the household level. A simpler method of thermal storage that can be adopted at the household level utilizes the internal air temperature of the home to store energy. By intelligently cycling air conditioners, while maintaining temperatures within a comfort zone instead of at a single setting, significant load can be shifted from peak hours. Such a scheme can also be applied to electric water heaters and electric heat.

II. Thermal Storage Example

The following example illustrates the potential for load shifting from thermal storage using air conditioning. The example utilizes a simple control scheme, based on the methodology outlined in the paper by Constantopoulos, Schweppe, and Larsen [1] and the optimization method developed by Daryanian [10]. Day ahead pricing data from the PJM system from July 8, 2003, along with Temperatures from Philadelphia, Pa are used as inputs to the model. The objective is to control the output of a residential air conditioning system for optimal cost savings. The result provides the potential economic savings from employing such a control scheme, as well as the resultant reductions in peak load power usage. Hourly pricing at the retail level is necessary for consumers to benefit from this thermal storage scheme.

The consumer's objective is to *minimize* the cost of air conditioning while maintaining the indoor air temperature within a certain range.

$$Min_e C_{ac} = \sum_i P_i * q_i \qquad (1)$$

s.t..

$$0 \le q_i \le q^{max}$$

$$T^{min} \le T_i \le T^{max}$$

where:

$T^{min} = T^{ideal} - d$

$T^{max} = T^{ideal} + d$

d = Acceptable temperature deviation

q_i - energy (kWh) consumed for air conditioning in hour i.
P_i - price of electricity ($/kWh) in hour i.
q^{max} - Maximum power output of Air conditioner

The hourly household temperature, T, is determined by:

$$T_{i+1} = \varepsilon T_i + (1-\varepsilon)(T^o - \eta^* q_i / A) \qquad (2)$$

TABLE 1. Parameters and Values of Residential AC Control Model

Variable	Value	Description
T_0	75	Initial temperature (°F)
η	2.5	Efficiency of AC (COP)
q_i		Power output of AC in hour i
q_{max}	3.5	Maximum power output of AC (KW)
E	0.93	System inertia
T^o		Outside Temperature (°F)
A	0.14	Thermal Conductivity (KW/°F)
T_d	75°	Desired household Temp (°F)
D	2°	Maximum acceptable Temperature Deviation (°F)

**Parameter values from [1 and 5]*

The optimization assumes that temperature variations within ± 2° F of the thermostat set point do not result in loss of consumer utility – this deviation is well within the 7° F comfort zone established by the ASHRAE Handbook (See Figure below).

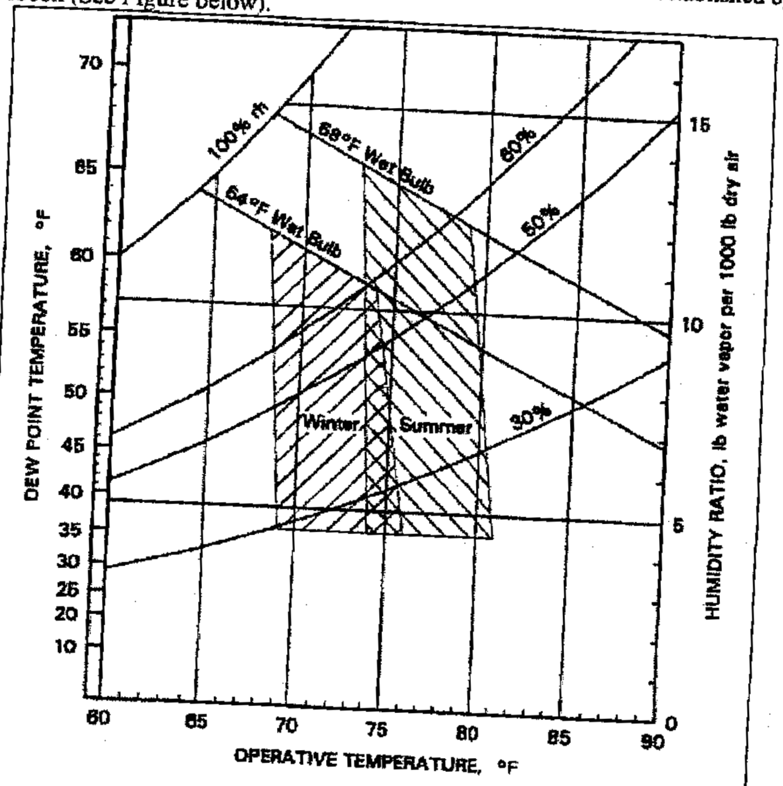


Fig. 5 ASHRAE Summer and Winter Comfort Zones
(Acceptable ranges of operative temperature and humidity for people in typical summer and winter clothing during primarily sedentary activity.)

Table 2 compares the results of applying a load control scheme to the AC versus the base case of allowing the AC to run on a single thermostat setting. It is assumed that the consumer is indifferent to indoor temperature fluctuations between 73° and 77°F ($T^{ideal} = 75°$, $d = 2°$)

Table 2. Normal vs. Controlled Air Conditioning Schemes

Date	8-Jul-03		Normal Cycling			Load Control		
Hr	Price ($/MWh)	Temp (outside)	Temp (inside)	Output (KWh)	Cost (mils)	Temp (inside)	Output (KWh)	Cost (mils)
1	$ 32.43	76	75.0	0.09	2.92	75.1	0.00	0.00
2	$ 24.23	78	75.0	0.31	7.51	75.3	0.00	0.00
3	$ 22.34	77	75.0	0.20	4.47	75.4	0.00	0.00
4	$ 21.43	75	75.0	0.00	0.00	75.4	0.00	0.00
5	$ 21.41	75	75.0	0.00	0.00	73.0	3.35	71.65
6	$ 23.45	74	74.9	0.00	0.00	73.0	0.09	2.11
7	$ 30.55	75	74.9	0.00	0.00	73.0	0.20	6.11
8	$ 39.65	77	75.0	0.10	4.16	73.0	0.40	15.86
9	$ 49.66	79	75.0	0.40	19.86	73.0	0.60	29.80
10	$ 58.45	82	75.0	0.70	40.92	73.0	0.90	52.61
11	$ 68.55	85	75.0	0.99	67.86	73.0	1.19	81.57
12	$ 82.31	84	75.0	0.90	74.08	73.0	1.10	90.55
13	$ 92.16	85	75.0	0.99	91.24	73.5	0.53	48.98
14	$ 105.32	87	75.0	1.21	127.44	74.4	0.00	0.00
15	$ 113.13	89	75.0	1.41	159.51	75.4	0.00	0.00
16	$ 118.23	88	75.0	1.30	153.70	76.3	0.00	0.00
17	$ 126.77	86	75.0	1.10	139.44	77.0	0.00	0.00
18	$ 118.94	86	75.0	1.10	130.84	77.0	0.90	107.05
19	$ 93.85	86	75.0	1.10	103.23	77.0	0.90	84.46
20	$ 83.79	85	75.0	0.99	82.95	77.0	0.79	66.19
21	$ 79.89	83	75.0	0.79	63.11	77.0	0.59	47.13
22	$ 69.03	83	75.0	0.79	54.53	77.0	0.59	40.73
23	$ 48.95	81	75.0	0.60	29.37	77.0	0.40	19.58
24	$ 43.72	81	75.0	0.60	26.23	75.0	3.26	142.39
			Totals -	15.67	1,383.38		15.79	906.77

Figure 2 below compares the controlled versus uncontrolled air conditioning consumption. The peak reduction in consumption is clear from the graph. Figure 3 illustrates the effect of pre-cooling to enable the reduction in peak consumption. When using thermal storage, the air is cooled (energy is stored) to the minimum temperature just prior to off peak hours and then allowed to rise during the peak hours (storage is discharged).

Figure 2. Comparison of Controlled to Uncontrolled Consumption

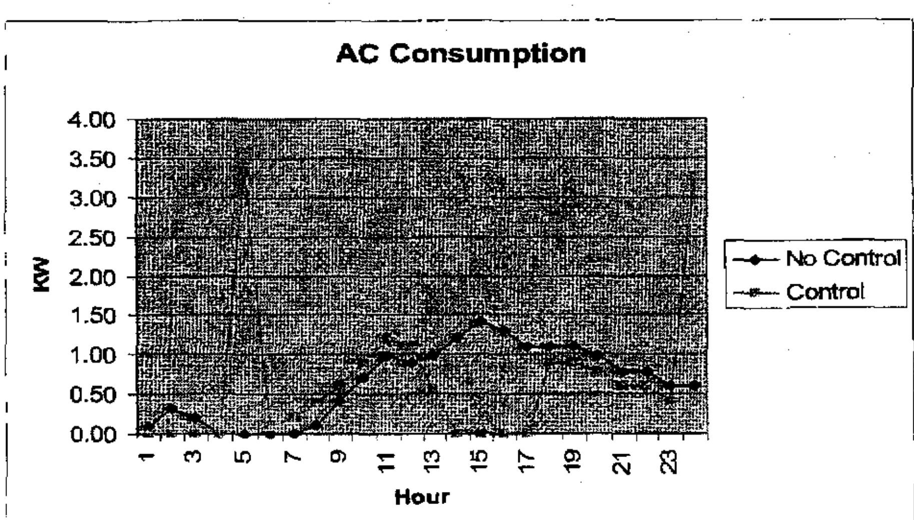
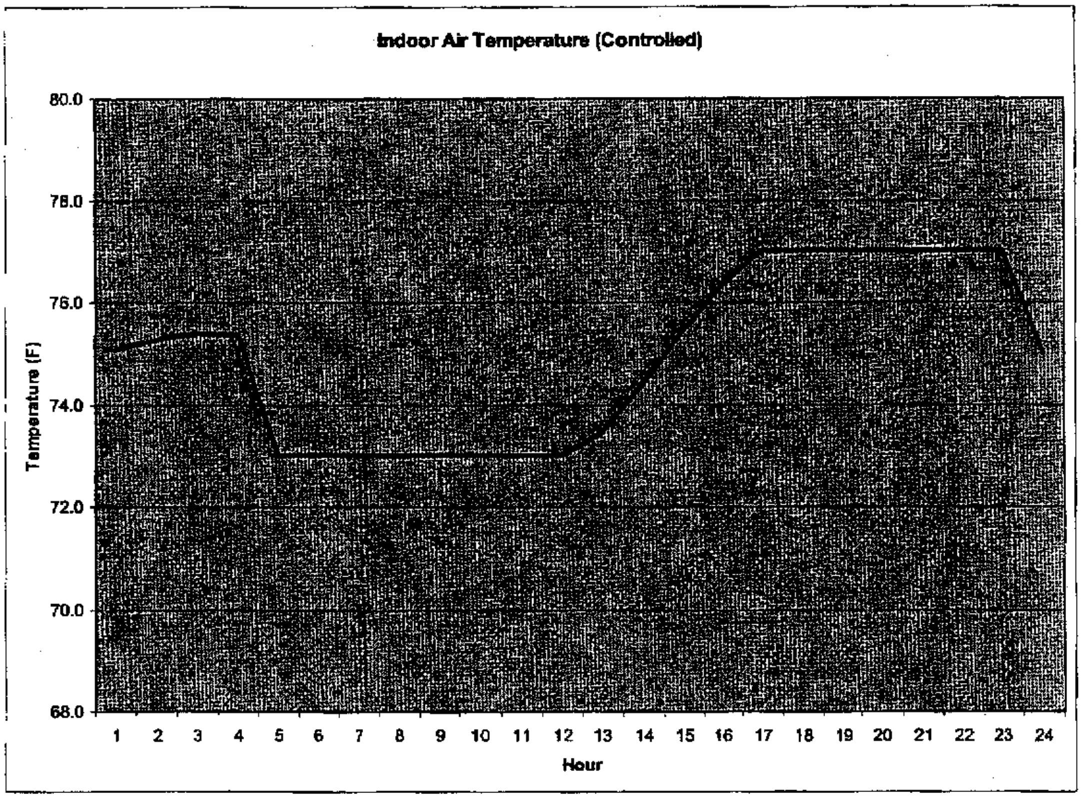


Figure 3. Indoor Air Temperature for Controlled Thermal Storage



As shown, during the five highest price hours of the day (hours 14-18), an 85% reduction in peak demand for air conditioning can be achieved by load shifting without moving outside the maximum temperature deviation. There is, however, a moderate increase in consumption in the hours before and immediately after the peak hours; with the highest consumption at beginning and end of the control period. The overall energy consumption increases very slightly, but the customer reduces their costs by over 33% for the day. The thermal storage control scheme enables significant savings and peak reductions while maintaining comfort. The system wide effects of large scale implementation of thermal storage are explored in subsequent sections.

III. Implementation

Implementing demand response requires investments at both the system and the customer levels. At the system level, the communications, metering, and billing infrastructure is necessary to facilitate a demand response program. Several utilities have invested in this infrastructure with the costs being included in their rate bases. Incentives for utilities to make such investments are limited because of potential lost revenues from reduced demand as well as the potential for eventual competitive entry facilitated by automation of metering and billing functions.

Real time metering capability is necessary to allow for hourly monitoring and billing of power consumption. Without such capability, it is not possible to allocate the costs/benefits of demand response directly to consumers. Two-way communications systems for sending price or other control signals to consumers and receiving near real time load information to assess charges are necessary. The ubiquity of internet communications and the relatively small bandwidth required significantly reduce the costs of implementing such communications systems. Programs in Florida Power and Puget Energy that utilize real time metering along with programmable thermostats currently charge less than $5 per customer per month for participants in their demand response programs [4]. Economies of scope may allow such costs to be reduced significantly.

Utilities must significantly upgrade their billing systems to enable near real time charges and to manage the much larger degree of information flows. The information will also enable utilities to have a much greater knowledge of system conditions and should improve their ability to forecast load.

Information programs are necessary in order to educate consumers on the potential benefits and methodologies of demand response programs, including but not limited to – thermal storage, hourly pricing, metering and control equipment. Studies have shown that such programs can be effective at inducing consumers to change their consumption behavior even without price signals. [14,15,16,17,18]

Large scale demand response can be implemented with either distributed or a coordinated control. Distributed demand response allows consumers to make their own consumption/response decisions based on incentives provided by the utility/Load Serving Entity/system operator. These incentives can include pricing schemes such as real time pricing, time of use pricing, critical peak pricing, or demand bidding. Consumers receive a price signal and respond accordingly. Studies of pricing programs have found limited response (typically with elasticities on the order of –0.1 [16]). The majority of these studies, however, did not provide enabling technologies to the customers. Programs that do provide enabling technologies have found significant potential, however most of these programs fall under the coordinated type of DR below. [4]

Utilities or system operators coordinate several current demand response programs. In these programs, customers agree to reduce load at the direction of the utility. The contract will often include a limit to the number of hours the utility may declare a demand reduction event, and allow the demand to ignore the event at the cost of paying a penalty. Such programs enable the utility to predict the demand response and to attempt to coordinate the DR with the system conditions. The limitations include a limited number of hours, the lack of incentives for DR in non-event hours, and the lack of investment in true peak shifting equipment since most participants simply shut down all or part of their load in response to an event.

IV. System Wide Effects of Demand Response

This section examines the effects of large scale implementation of the thermal storage scheme outlined above. The individual case assumes that prices are unchanged by the actions of a single household. This assumption will hold in general, but when a sufficient number of consumers are participating in thermal storage market prices will be affected. A non-linear dynamic simulation model was used to evaluate the long run effects on market prices, generation capacity, and consumer savings from widespread adoption of thermal storage technologies.

The model uses data from the PJM system for the year 2003. The average air conditioning consumption in PJM is 640 KWh/yr [2]. The model uses a simple generation investment heuristic based on segment revenues to determine the effects of large-scale implementation of demand response on generation capacity. Consumers adopt the thermal storage according to their potential savings and awareness of the technology (via wor dof mouth). In addition, the model includes long term demand elasticity to include the rebound effect in the analysis.

The model segments the electricity market into base-load (18% of hours), intermediate (68% of hours), peak (13% of hours), and critical peak segments (1% of hours). Results from the optimization model outlined above were used as inputs to determine the amount of load shifted by each consumer from peak and critical peak hours to intermediate hours. A piecewise linear supply curve (See Figure 4) is used to determine the market clearing price; each segment is represented by the supply function. This curve was derived from the aggregate load and price data from PJM.

Figure 4 also shows the long term effects on the aggregate supply curve of implementing large scale demand response. The supply curve becomes steeper as peak load generation capacity is reduced due to a reduction in peak load. This mitigates the long term price savings seen by customers who do not participate (free riders) in demand response. On the other hand, the expected diminishing returns as more and more consumers participate, while still a factor, are also mitigated somewhat. It must be noted that even though the curve is steeper, the peak prices, on average, will be reduced significantly (nearly 25%) except for in the few critical peak hours when demand is highest.

Figure 4. Supply Curve with and without Load Shifting

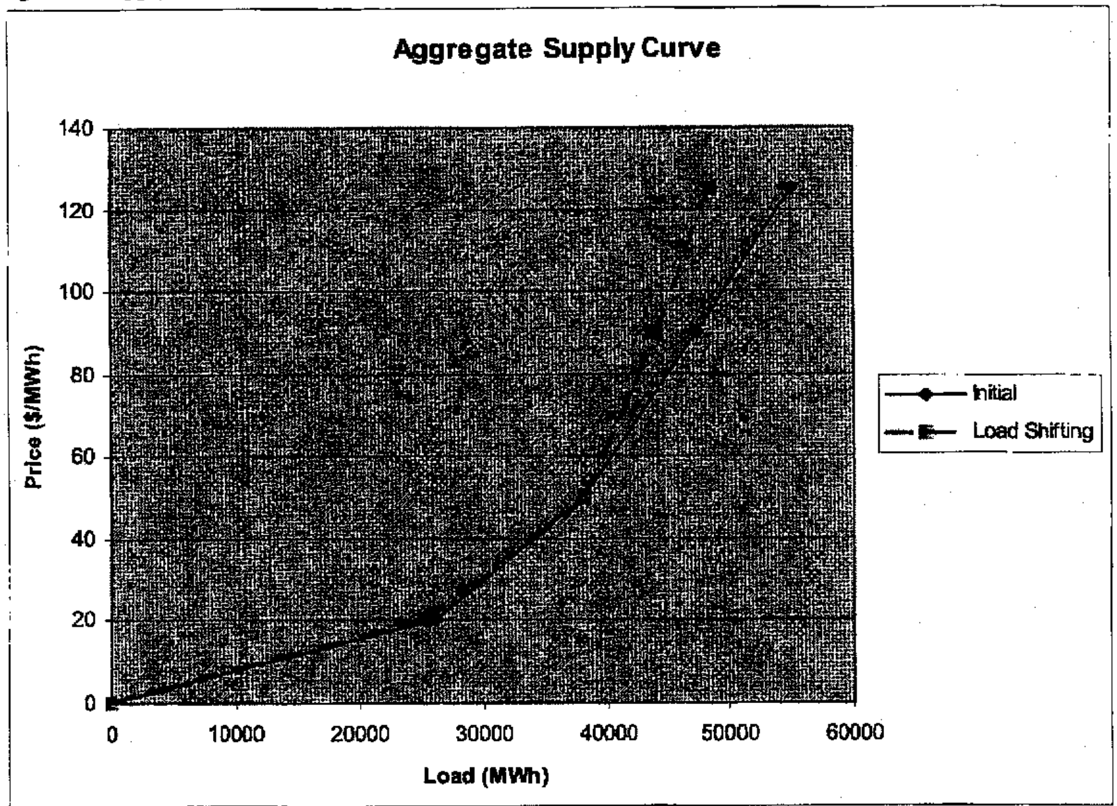


Figure 5. Generation Capacity by Sector

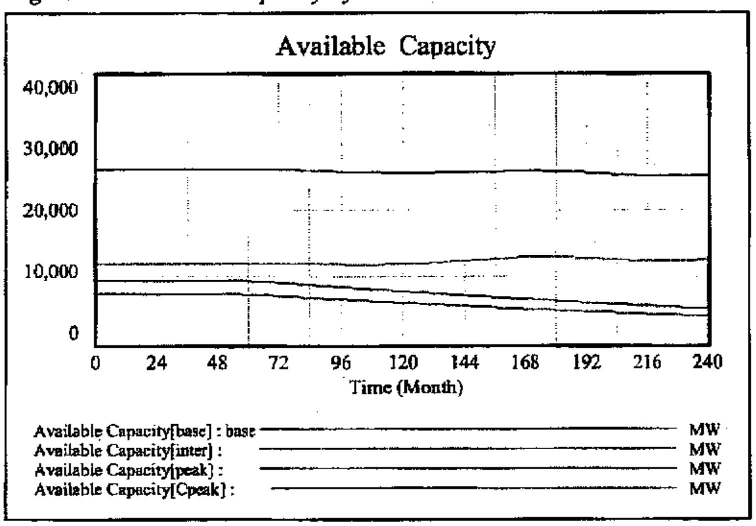
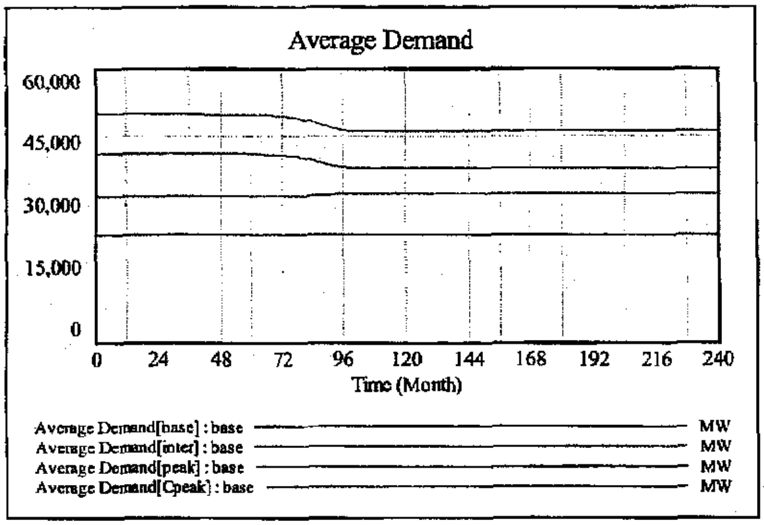


Figure 6. Average Hourly Demand by Segment



The results of the model indicate that demand in peak and critical peak hours is reduced by 8% (see Figure 6). System generation capacity is reduced by 12%. Base generation capacity decreases by 2%, intermediate capacity increases by 7% and peak capacity is reduced by 29%. Intermediate capacity increases due to a combination of higher utilization and increased prices in intermediate hours.

Because of diminishing returns, it is only cost effective for 25% of users to participate in load shifting. At this point, the costs of investing in the control equipment exceed the benefits of load shifting.

The model shows that the savings resulting from thermal storage are sufficient (in the PJM system) to cover the individual costs of installation, but not the system costs. Since all consumers benefit from the demand response program, it is not unreasonable to socialize the system costs. In addition, the externalities may prove large enough to justify some subsidization of the individual costs. Non-participants will receive the benefits of reduced costs and may otherwise free ride on the investments of participants.

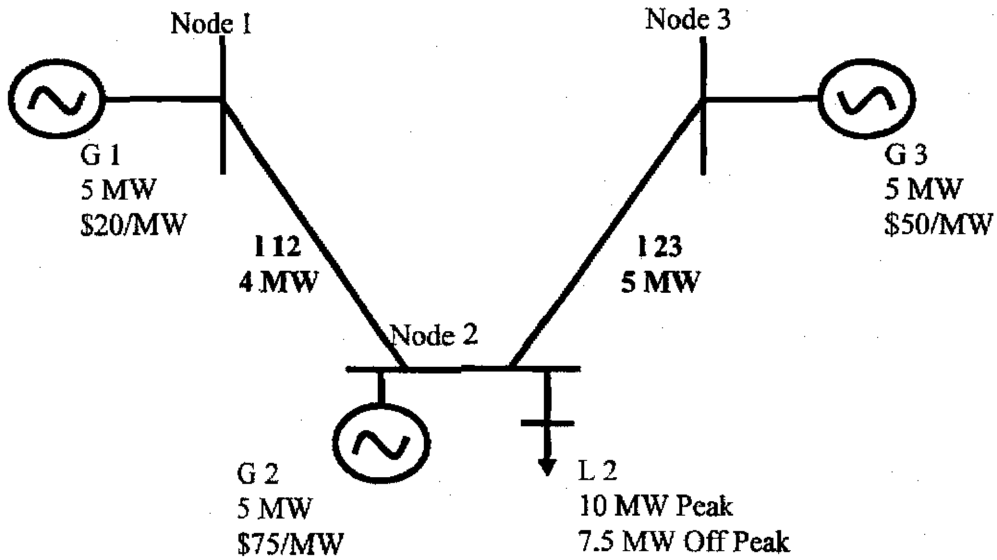
V. Investment Substitution with Demand Response

Reducing the peak load will directly impact the required transmission capacity since the system is built for the peak. The overall utilization of lines will also increase as the peak is reduced and the load smoothed. This will increase flow-based revenues for transmission companies, but will also reduce congestion charges.

Demand response also has significant potential to reduce the need for ancillary services. By smoothing the overall system load and shifting reactive power demand away from system peak loading, thermal storage will reduce the need for ancillary services such as VAR compensation, frequency control, and reserves. In addition to reducing the need for ancillary services from load shifting, demand resources can be utilized directly for VAR compensation, frequency control, and short term reserves.

As with traditional demand side management programs, investments in the infrastructure for demand response should include analysis of the avoided costs (least cost planning). The difference is that often investments in demand response infrastructure, such as real time metering, are an indirect method of reducing demand and therefore may be difficult to quantify. The infrastructure enables demand response and is a necessary but not sufficient component of demand response. The components of consideration should include reductions in spot prices (including LMP), the elimination of capacity expansion in generation, transmission, and distribution, and reductions in reserves and ancillary services. The value of demand response for increasing reliability is significant and should be included as well.

Figure 7. Example 3 node system



In the follow ing example, the simple three-node system above is used to illustrate the potential avoided costs of transmission or generation expansion from DR.

In this system, the peak price will be $75/MW with 4MW from G1, 5 MW from G3, and 1 MW from G2. The off peak price will be $50/MW with 4MW from G1 and 3.5 MW from G3.

With 10% DR (assuming .5MW shifted before and .5 MW shifted after the peak time period) the load will be 9 MW peak and 8 MW off peak. Under these conditions, the price will be $50/MW in both peak and off peak hours.

For N-1 security criteria to be satisfied, the system would have to add 1 MW of capacity either to line 1-2 or to generator 2 without demand response. Demand response allows the N-1 criteria to be satisfied with no additional investments. This illustrates the value of demand response for improving system reliability. Demand response can also be used in contingency/emergency situations to shed load without major service disruptions, which would be a significant improvement over rolling blackouts.

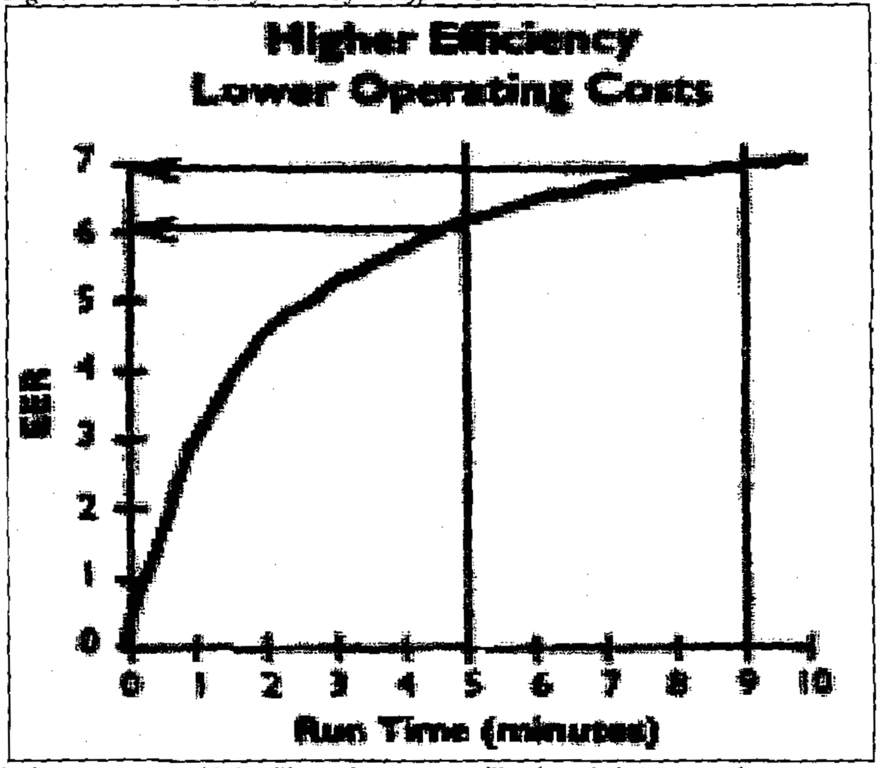
This example demonstrates the ability for demand response to substitute for capacity investments. The concept of avoided costs and least cost planning has been used for demand side management programs for many years. Typically the analysis of demand response programs includes only the direct economic savings from reductions in peak consumption. The indirect savings resulting from investments in infrastructure to support demand response, including reliability improvements and capacity substitution, should be incorporated in analysis of such investments.

VI. Additional Potential Benefits

There are multiple secondary benefits associated with technologies required for implementing demand response. These include improved efficiency of consumption, better customer service, and the potential for additional services.

The thermal control scheme will increase the cycle time of the air conditioner, which will also increase the efficiency and result in improved humidity reduction. The Energy Efficiency Ratio, EER (Btu/Wh) for air conditioners increases with cycle time, as does the amount of moisture that condenses and is collected. [12] (See Figure 8).

Figure 8. EER versus Cycle time for a typical Air Conditioner



It is likely that consumers with intelligent thermostats will reduce their consumption even more than the simple load shifting scenario outlined above. With greater control over temperatures and easier programming methods, consumers will be much more likely to allow their air conditioners to idle while they are away from home, thus possibly saving a great deal of electricity.

The automated metering systems also enable faster, more accurate fault detection since utilities can isolate the locations of faults as soon as they occur. They also increase customer service by providing more accurate billing and real time updates on changes to load. Additional services enabled by the metering and communications infrastructure include home security services and the bundling of water and natural gas metering.

Typical demand resopnse evaluations focus primarily on the avoided costs from reductions of peak prices. Additional savings are available from alleviating transmission congestion and eliminating the necessity of additional investments. Large Scale Demand response utilizing thermal storage has the potential to significantly increase efficiency of the electric power system and reduce the overall infrastructure capacity.

VII. Future Research

There are several areas of future research necessary to determine the long-term implications of large-scale adoption of demand response technologies. Research is necessary in engineering, economics, and political/social science. This research can be conducted through a combination of laboratory simulation and monitoring of ongoing implementations by innovative utilities.

In engineering, possible transient stability issues resulting from simultaneous action by loads in response to discontinuous pricing periods (currently hourly) should be investigated. The magnitude of complementary benefits such as increased efficiency from extending cycle times can also be determined. In addition, development of control algorithms that are cost effective, easily implemented, acceptable and understandable for residential consumers is a precursor for large-scale adoption. Methods to integrate demand response for ancillary services including frequency control, VAR support, and reserves also need further development. [6,11] Protection schemes that integrate demand response have significant potential and should be pursued as well. Line losses will be reduced in the short term as demand response reduces loading, but may increase in the long term if overall utilization is increased due to higher load factors.

Open research issues in economics include: Determination of the costs of information and education programs to promote consumer acceptance of demand response technologies; Further studies of the potential savings to include reductions in market power and the real options value of response technologies; determination of the magnitude of rebound effects from reduced prices and whether such effects are more or less peak coincident than current demand profiles; Determination of the long term effects on investment in generation, transmission, and distribution, including the possibility of stranded assets; Evaluation of market clearing mechanisms and the potential for instability or oscillatory behavior due to lumpy response behavior; Evaluation of various market designs to determine the incentives for investments in demand response .

Political and Social research on coalition formation, stakeholders and status quo bias, regulatory support/capture and uncertainty, and consumer behavior can determine the conditions and incentive structures necessary to promote large scale implementation/adoption of demand response technologies.

Demand response technologies have the potential to dramatically change the operation of the electric power system and to increase the efficiency of capital investments. Further research can help determine stable pathways to integrate demand response into the current system architecture.

References

1. Constantopoulos, P., Schweppe, F. and Larson, R., "ESTIA: A Real-time Consumer control Scheme for Space Conditioning Usage Under Spot Electricity Pricing." *Computers Operations Research*, vol 19, no. 8, pp 751-765, 1991.United States Department of Energy, *Residential Energy Consumption Survey (RECS)*, 2001. http://www.eia.doe.gov/emeu/recs/contents.html
3. Ilic, M.; Black, J.W.; Watz, J.L , "Potential Benefits of Implementing Load Control", *Proceedings IEEE Power Engineering Society Winter Meeting*, 2002 , Vol. 1 , pp. 177 -182, New York, NY, January 2002
4. United States Government Accountability Office, "Consumers Could Benefit from Demand-Response Programs, but Challenges Remain," August, 2004. http://www.gao.gov/new.items/d04844.pdf
5. *2001 ASHRAE Handbook: Fundamentals*, American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., Atlanta, GA, 2001.Black, J and Ilic, M., "Demand-Based Frequency Control for Distributed Generation", *Proceedings IEEE Power Engineering Society Summer Meeting*, 2002, Chicago, IL, July 2002.Black, Jason W., Ilic, Marija, "Survey Of Technologies And Cost Estimates For Residential Electricity Services", *Proceedings of the IEEE Power Engineering Society Summer Meeting*, July 2001."Review of Current Souther California Edison Load Management Programs and Proposal for a New Market-Driven, Mass-Market, Demand-Response Program", California Energy Commission, Feb 2004.Fumagalli, E.; Black, J.W.; Ilic, M.; Vogelsang, I., "Quality of Service Provision in Electric Power Distribution Systems Through Reliability Insurance", *IEEE Transactions on Power Systems*, Accepted for Publication, March 2004.Daryanian, B. "Scheduling of Electricity Consumption under Spot Prices." Ph.D. Thesis, Department of Mechanical Engineering, Massachusetts Institute of Technology, 1989.Ilic M., Skantze P., Yu C.N., Fink L., Cardell J., "Power Exchange for frequency control (PXFC)", *Proceedings of the IEEE PES Winter Meeting*, New York, NY, January 1999.Proctor, J., Katsnelson, Z., and Wilson, B, "Bigger is Not Better: Sizing Air Conditioners Properly", *Home Energy Magazine Online*, May/June 1995 Isamu Matsukawa, "The Effects of Information on Residential Demand for Electricity," *The Energy Journal*, Vol.25, Iss. 1; pg. 1, 17 pgs, 2004.
14. Bushnell, J. and Mansur, E., "The Impact of Retail Rate Deregulation on Electricity Consumption in San Diego", POWER Working Paper (PWP-082), April 2001.
15. Caves, D. and Christensen, L, "Residential Substitution of Off-Peak for Peak Electricity Usage under Time-of-Use Electricity Pricing", *The Energy Journal*, Vol. 1, No. 2, 1980.

16. Caves, D., Christensen, L., and Herriges, J., "Consistency of Residential Customer Response in Time-of-Use Electricity Pricing Experiments", *Journal of Econometrics*, vol. 26, pp 179-203, 1984, North-Holland.Caves, D., Eakin, K., and Faruqui, A., "Mitigating Price Spikes in Wholesale Markets through Market-Based Pricing in Retail Markets", *The Electricity Journal*, April 2000.Braithwait, S. and Faruqui, A., "The Choice Not to Buy: Energy Savings and Policy Alternatives for Demand Response", *Public Utilities Fortnightly*, March 15, 2001.

Jason W. Black is pursuing a Ph.D. in Engineering Systems at MIT, focusing on electric power systems and regulation. He received a B.S. degree in Electrical Engineering and a B.A. in International Studies from the University of Notre Dame in 1994. He is a member of IEEE, IAEE. He is currently an NSF IGERT fellow, and previous honors include a Martin Fellowship for Sustainability and membership in Tau Beta Pi and Eta Kappa Nu. Mr. Black also has significant experience with the US Army and in Management Consulting. He can be reached at jwblack@mit.edu.

ICC Docket No. 07-0540

**Commonwealth Edison Company's Response to
CUB's (CUB) Data Requests 1.02 – 1.23
Dated: November 21, 2007**

REQUEST NO. CUB 1.19:

Provide all documents, studies and work papers supporting the "one-time promotional O&M cost to acquire a new customer of $80 per participant." ComEd Ex. 3.0, line 274.

RESPONSE:

Person responsible for response

James Eber, Commonwealth Edison Company

The $80 estimate is based on ongoing confidential negotiations between ComEd and a vendor. At such time that a final agreement is reached, ComEd will supplement this response with supporting documentation.

ICC Docket No. 07-0540

**Commonwealth Edison Company's Response to
CUB's (CUB) Data Requests 1.02 – 1.23
Dated: November 21, 2007**

REQUEST NO. CUB 1.09:

If the Rider AC7 Nature First program was called for the maximum number of events allowed under its tariff, what would the energy payments have been for 2006 and 2007?

RESPONSE:

Person responsible for response

James Eber, Commonwealth Edison Company

ComEd objects to this request on the basis that it seeks information that is neither relevant nor reasonably calculated to lead to the discovery of admissible evidence. Without waiving this objection, ComEd states that in 2006, Nature First only was enrolled in PJM's capacity program. That capacity program did not allow self-scheduling of demand response events or provide for energy payments. Therefore, in 2006, ComEd could not receive energy payments for calling Nature First for the maximum number of events.

In 2007, ComEd enrolled Nature First in both PJM's capacity program and PJM's economic demand response program. The economic demand response program allows ComEd to self-schedule demand response events and provides for energy payments. The energy payments for the maximum number of events allowed under Rider AC7 in 2007 (*i.e.*, 20 events) are estimated in the attached spreadsheet (CUB 1.09_Attach 1). In preparing the attached spreadsheet, ComEd used the hottest twenty summer weekdays. The estimated energy payment from PJM if the Nature First program were called for the maximum number of events in 2007 would have been $527,308.

Total KW
54977

Average LMP	NF Credit
108.48	$35,783.55
41.10	$0.00
56.59	$4,254.17
65.74	$4,399.71
98.95	$32,640.92
90.15	$25,711.58
91.56	$30,200.97
81.61	$22,898.88
93.24	$27,166.14
90.56	$29,872.76
93.83	$30,950.19
102.60	$33,845.04
151.09	$49,838.80
101.74	$33,558.68
108.24	$35,703.32
133.18	$43,931.80
113.98	$37,596.93
110.15	$36,333.72
95.27	$31,424.70
91.61	$26,195.70
	$572,307.56

Start of Real Time LMP Data				Hour Ending (CST)		1300	1400
Date	PnodeID	Name	Voltage	Equipment Type	Zone	TotalLMP	TotalLMP
20070607	33092371	COMED		ZONE		84.2512	108.2555
20070614	33092371	COMED		ZONE		37.23943	68.77099
20070615	33092371	COMED		ZONE		50.42411	66.89029
20070618	33092371	COMED		ZONE		68.42741	65.28907
20070625	33092371	COMED		ZONE		77.72053	91.55046
20070626	33092371	COMED		ZONE		104.8086	97.03135
20070627	33092371	COMED		ZONE		76.48209	98.19442
20070705	33092371	COMED		ZONE		82.38394	84.18245
20070709	33092371	COMED		ZONE		65.3257	95.76295
20070730	33092371	COMED		ZONE		78.54641	83.28806
20070731	33092371	COMED		ZONE		90.26317	93.58472
20070801	33092371	COMED		ZONE		88.85732	89.67834
20070802	33092371	COMED		ZONE		127.2478	233.3073
20070803	33092371	COMED		ZONE		88.29418	89.42713
20070807	33092371	COMED		ZONE		86.74236	105.7316
20070822	33092371	COMED		ZONE		134.1388	99.3304
20070828	33092371	COMED		ZONE		89.42281	143.6122
20070904	33092371	COMED		ZONE		139.7198	140.6356
20070905	33092371	COMED		ZONE		80.7164	88.41731
20070924	33092371	COMED		ZONE		74.14519	80.72237

Start of Real Time LMP Data						1300	1400
Date	PnodeID	Name	Voltage	Equipment Type	Zone	TotalLMP	TotalLMP
20070607	33092371	COMED		ZONE		84.2512	108.2555
20070614	33092371	COMED		ZONE		0	0
20070615	33092371	COMED		ZONE		0	0
20070618	33092371	COMED		ZONE		0	0
20070625	33092371	COMED		ZONE		77.72053	91.55046
20070626	33092371	COMED		ZONE		104.8086	97.03135
20070627	33092371	COMED		ZONE		76.48209	98.19442
20070705	33092371	COMED		ZONE		82.38394	84.18245
20070709	33092371	COMED		ZONE		0	95.76295
20070730	33092371	COMED		ZONE		78.54641	83.28806
20070731	33092371	COMED		ZONE		90.26317	93.58472
20070801	33092371	COMED		ZONE		88.85732	89.67834
20070802	33092371	COMED		ZONE		127.2478	233.3073
20070803	33092371	COMED		ZONE		88.29418	89.42713
20070807	33092371	COMED		ZONE		86.74236	105.7316
20070822	33092371	COMED		ZONE		134.1388	99.3304
20070828	33092371	COMED		ZONE		89.42281	143.6122
20070904	33092371	COMED		ZONE		139.7198	140.6356
20070905	33092371	COMED		ZONE		80.7164	88.41731
20070924	33092371	COMED		ZONE		0.945188	80.72237

KW Per Customer	# of Customers
0.99	55,387

Calculated from Noon to 6 PM

Date	Day of Week	Average Temp	Max Temp
6/7/2007	Thursday	81	91
6/14/2007	Thursday	77	89
6/15/2007	Friday	79	91
6/18/2007	Monday	78	89
6/25/2007	Monday	77	89
6/26/2007	Tuesday	78	92
6/27/2007	Wednesday	77	91
7/5/2007	Thursday	79	89
7/9/2007	Monday	79	94
7/30/2007	Monday	78	89
7/31/2007	Tuesday	82	91
8/1/2007	Wednesday	81	92
8/2/2007	Thursday	82	91
8/3/2007	Friday	80	90
8/7/2007	Tuesday	82	91
8/22/2007	Wednesday	79	90
8/28/2007	Tuesday	79	91
9/4/2007	Tuesday	77	89
9/5/2007	Wednesday	78	90
9/24/2007	Monday	79	90
		Total	

1500 TotalLMP	1600 TotalLMP	1700 TotalLMP	1800 TotalLMP
156.6914	112.7888	108.6216	80.27203
31.58925	33.78659	41.44992	33.74577
77.38065	51.60924	51.70912	41.49801
79.64294	73.585	62.54781	44.9556
95.8944	124.0143	98.44141	106.0971
99.90493	89.00216	73.77747	76.35312
99.8039	103.6686	89.57377	81.61425
81.27981	88.34761	80.32268	73.15764
138.645	91.20898	88.34718	80.17115
89.72758	91.69704	95.73456	104.3734
90.68259	94.82934	98.38862	95.21628
117.7414	106.917	109.3229	103.1033
155.8312	169.0061	137.9864	83.15803
84.47814	152.3817	98.66862	97.1619
134.1004	127.9328	103.5274	91.38664
122.2849	178.5972	141.247	123.494
146.9911	94.17103	123.8463	85.82131
91.81609	98.45545	99.18455	91.07637
118.7118	113.8813	93.48504	76.38395
97.83094	108.3375	110.8901	77.75737

1500 TotalLMP	1600 TotalLMP	1700 TotalLMP	1800 TotalLMP
156.6914	112.7888	108.6216	80.27203
0	0	0	0
77.38065	0	0	0
79.64294	0.384996	0	0
95.8944	124.0143	98.44141	106.0971
99.90493	89.00216	0.577473	76.35312
99.8039	103.6686	89.57377	81.61425
81.27981	88.34761	80.32268	0
138.645	91.20898	88.34718	80.17115
89.72758	91.69704	95.73456	104.3734
90.68259	94.82934	98.38862	95.21628
117.7414	106.917	109.3229	103.1033
155.8312	169.0061	137.9864	83.15803
84.47814	152.3817	98.66862	97.1619
134.1004	127.9328	103.5274	91.38664
122.2849	178.5972	141.247	123.494
146.9911	94.17103	123.8463	85.82131
91.81609	98.45545	99.18455	91.07637
118.7118	113.8813	93.48504	76.38395
97.83094	108.3375	110.8901	77.75737

Day of Week	Date	Channel	Units	Average Temp	Max Temp	1:00	2:00
Thursday	6/7/2007	O'Hare Airport Temp.	Fahren	81	91	71	71
Thursday	6/14/2007	O'Hare Airport Temp.	Fahren	77	89	67	66
Friday	6/15/2007	O'Hare Airport Temp.	Fahren	79	91	68	67
Monday	6/18/2007	O'Hare Airport Temp.	Fahren	78	89	77	75
Monday	6/25/2007	O'Hare Airport Temp.	Fahren	77	89	67	66
Tuesday	6/26/2007	O'Hare Airport Temp.	Fahren	78	92	73	73
Wednesday	6/27/2007	O'Hare Airport Temp.	Fahren	77	91	76	75
Thursday	7/5/2007	O'Hare Airport Temp.	Fahren	79	89	72	72
Monday	7/9/2007	O'Hare Airport Temp.	Fahren	79	94	79	78
Monday	7/30/2007	O'Hare Airport Temp.	Fahren	78	89	68	66
Tuesday	7/31/2007	O'Hare Airport Temp.	Fahren	82	91	74	73
Wednesday	8/1/2007	O'Hare Airport Temp.	Fahren	81	92	74	75
Thursday	8/2/2007	O'Hare Airport Temp.	Fahren	82	91	75	75
Friday	8/3/2007	O'Hare Airport Temp.	Fahren	80	90	79	78
Tuesday	8/7/2007	O'Hare Airport Temp.	Fahren	82	91	77	76
Wednesday	8/22/2007	O'Hare Airport Temp.	Fahren	79	90	77	76
Tuesday	8/28/2007	O'Hare Airport Temp.	Fahren	79	91	71	71
Tuesday	9/4/2007	O'Hare Airport Temp.	Fahren	77	89	71	72
Wednesday	9/5/2007	O'Hare Airport Temp.	Fahren	78	90	72	71
Monday	9/24/2007	O'Hare Airport Temp.	Fahren	79	90	69	71
Tuesday	7/10/2007	O'Hare Airport Temp.	Fahren	76	89	71	71
Friday	9/21/2007	O'Hare Airport Temp.	Fahren		88	66	68
Tuesday	9/18/2007	O'Hare Airport Temp.	Fahren		88	69	70
Monday	9/3/2007	O'Hare Airport Temp.	Fahren		88	67	67
Monday	8/6/2007	O'Hare Airport Temp.	Fahren		88	77	77
Thursday	8/23/2007	O'Hare Airport Temp.	Fahren		87	71	71
Tuesday	8/21/2007	O'Hare Airport Temp.	Fahren		87	71	70
Wednesday	8/8/2007	O'Hare Airport Temp.	Fahren		87	81	80
Wednesday	6/13/2007	O'Hare Airport Temp.	Fahren		87	65	65
Friday	8/10/2007	O'Hare Airport Temp.	Fahren		86	73	73
Friday	7/6/2007	O'Hare Airport Temp.	Fahren		86	71	71
Wednesday	7/4/2007	O'Hare Airport Temp.	Fahren		86	69	68
Monday	6/11/2007	O'Hare Airport Temp.	Fahren		86	66	64
Tuesday	9/25/2007	O'Hare Airport Temp.	Fahren		85	79	78
Wednesday	8/29/2007	O'Hare Airport Temp.	Fahren		85	75	75
Wednesday	7/25/2007	O'Hare Airport Temp.	Fahren		85	73	73
Wednesday	7/18/2007	O'Hare Airport Temp.	Fahren		85	73	73
Friday	6/1/2007	O'Hare Airport Temp.	Fahren		85	65	62
Wednesday	9/19/2007	O'Hare Airport Temp.	Fahren		84	73	73
Friday	9/7/2007	O'Hare Airport Temp.	Fahren		84	75	75
Tuesday	8/14/2007	O'Hare Airport Temp.	Fahren		84	66	67
Thursday	8/9/2007	O'Hare Airport Temp.	Fahren		84	74	73
Wednesday	6/20/2007	O'Hare Airport Temp.	Fahren		84	65	65
Friday	7/27/2007	O'Hare Airport Temp.	Fahren		83	76	76
Thursday	7/26/2007	O'Hare Airport Temp.	Fahren		83	75	74
Monday	7/23/2007	O'Hare Airport Temp.	Fahren		83	63	64
Thursday	7/19/2007	O'Hare Airport Temp.	Fahren		83	72	72
Tuesday	7/17/2007	O'Hare Airport Temp.	Fahren		83	70	71
Tuesday	7/3/2007	O'Hare Airport Temp.	Fahren		83	65	65
Tuesday	6/12/2007	O'Hare Airport Temp.	Fahren		83	68	68
Thursday	9/6/2007	O'Hare Airport Temp.	Fahren		82	75	75

Tuesday	7/24/2007	O'Hare Airport Temp.	Fahren	82	68	68
Monday	7/16/2007	O'Hare Airport Temp.	Fahren	82	69	68
Monday	8/13/2007	O'Hare Airport Temp.	Fahren	81	73	74
Friday	6/8/2007	O'Hare Airport Temp.	Fahren	81	81	81
Monday	9/17/2007	O'Hare Airport Temp.	Fahren	80	56	54
Friday	8/24/2007	O'Hare Airport Temp.	Fahren	80	72	71
Wednesday	8/15/2007	O'Hare Airport Temp.	Fahren	80	77	75
Thursday	7/12/2007	O'Hare Airport Temp.	Fahren	80	65	63
Tuesday	6/19/2007	O'Hare Airport Temp.	Fahren	80	74	72
Monday	8/27/2007	O'Hare Airport Temp.	Fahren	79	64	63
Friday	8/17/2007	O'Hare Airport Temp.	Fahren	79	66	66
Monday	7/2/2007	O'Hare Airport Temp.	Fahren	79	55	57
Thursday	9/20/2007	O'Hare Airport Temp.	Fahren	78	65	64
Thursday	9/13/2007	O'Hare Airport Temp.	Fahren	78	52	51
Monday	8/20/2007	O'Hare Airport Temp.	Fahren	78	68	66
Friday	7/13/2007	O'Hare Airport Temp.	Fahren	78	61	61
Friday	8/31/2007	O'Hare Airport Temp.	Fahren	77	58	58
Thursday	8/16/2007	O'Hare Airport Temp.	Fahren	77	73	72
Wednesday	7/11/2007	O'Hare Airport Temp.	Fahren	77	70	68
Thursday	6/21/2007	O'Hare Airport Temp.	Fahren	77	72	71
Friday	6/22/2007	O'Hare Airport Temp.	Fahren	76	61	61
Thursday	9/27/2007	O'Hare Airport Temp.	Fahren	75	54	53
Thursday	8/30/2007	O'Hare Airport Temp.	Fahren	75	68	67
Friday	7/20/2007	O'Hare Airport Temp.	Fahren	75	63	63
Monday	9/10/2007	O'Hare Airport Temp.	Fahren	74	66	66
Thursday	6/28/2007	O'Hare Airport Temp.	Fahren	74	73	73
Friday	9/28/2007	O'Hare Airport Temp.	Fahren	73	53	55
Tuesday	9/11/2007	O'Hare Airport Temp.	Fahren	71	55	55
Wednesday	6/6/2007	O'Hare Airport Temp.	Fahren	71	49	48
Monday	6/4/2007	O'Hare Airport Temp.	Fahren	71	63	62
Friday	6/29/2007	O'Hare Airport Temp.	Fahren	70	58	57
Wednesday	9/26/2007	O'Hare Airport Temp.	Fahren	69	63	60
Wednesday	9/12/2007	O'Hare Airport Temp.	Fahren	67	54	52
Friday	9/14/2007	O'Hare Airport Temp.	Fahren	66	66	66
Tuesday	6/5/2007	O'Hare Airport Temp.	Fahren	64	59	58

3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00
72	72	73	73	75	76	78	81	84
65	65	64	64	68	73	77	83	86
67	63	64	67	70	77	80	83	86
74	74	75	74	75	78	81	84	87
67	66	68	65	70	72	75	77	81
72	70	71	71	75	79	82	84	86
74	74	73	73	74	75	78	80	83
71	71	72	73	74	76	78	81	82
77	76	75	73	75	78	83	86	88
64	64	62	65	68	73	78	81	83
72	72	71	68	73	78	82	86	88
73	73	71	71	69	78	83	85	88
74	74	71	70	74	79	82	85	85
76	75	73	70	72	77	80	83	86
77	73	73	73	72	74	76	78	83
77	79	72	71	69	72	75	77	80
70	69	67	69	69	74	77	79	83
68	68	65	63	66	70	76	80	83
71	71	68	66	69	72	75	80	84
70	69	68	69	71	72	75	78	82
71	70	69	71	73	74	76	80	82
67	67	67	67	64	69	73	77	81
68	67	68	65	63	68	72	76	79
67	67	67	66	66	71	75	78	80
77	77	77	77	77	78	80	81	82
70	70	71	70	70	73	75	78	81
70	70	70	70	70	69	71	73	75
78	77	77	75	76	77	79	81	84
63	62	60	63	66	70	75	79	82
73	74	72	71	73	75	79	80	83
68	69	68	66	69	72	74	77	79
68	68	68	67	69	70	72	74	76
63	61	58	63	67	72	75	79	80
77	77	77	76	76	75	75	76	79
74	72	71	70	69	74	78	82	83
73	72	71	72	72	73	76	78	80
72	71	70	69	70	73	73	76	80
65	67	66	66	67	70	73	75	76
73	72	72	70	69	70	72	74	75
73	73	73	72	73	74	75	75	79
70	67	68	65	65	66	69	71	74
72	72	73	72	72	74	76	77	79
63	62	62	61	65	70	74	76	78
76	74	71	71	72	70	73	75	78
73	73	66	66	67	68	71	73	75
65	60	63	62	67	70	73	76	78
71	71	72	72	72	72	71	72	75
71	70	69	68	70	70	69	69	71
63	62	62	60	65	69	70	75	77
65	62	65	65	69	73	76	79	81
75	75	74	75	74	75	76	78	80

67	65	68	69	70	72	72	74	77
67	66	65	65	67	70	73	76	81
73	72	71	71	73	75	75	76	78
79	78	77	76	74	73	71	70	67
53	52	52	53	56	58	61	64	70
70	70	70	69	70	70	71	73	74
74	72	73	71	73	74	75	76	76
63	62	61	61	63	67	70	73	75
67	70	70	71	71	72	72	73	74
63	62	61	60	62	67	70	72	73
65	65	65	64	65	68	71	73	75
57	53	55	55	61	65	68	70	72
63	62	61	61	60	64	67	71	74
53	51	51	51	50	55	61	66	69
68	69	69	69	70	71	72	73	74
61	60	58	60	63	65	68	70	73
57	57	59	58	60	63	68	72	74
72	71	71	71	70	72	74	75	76
67	66	64	62	63	64	66	68	71
72	71	70	69	71	73	75	74	77
62	64	66	67	68	67	68	70	72
52	51	49	52	52	54	61	62	67
66	65	64	64	63	67	70	70	72
63	62	61	58	60	64	66	68	69
66	65	66	66	65	66	68	68	69
74	72	69	68	68	69	70	70	71
53	55	55	55	56	57	61	64	66
54	53	51	50	50	52	55	59	62
46	46	45	44	51	57	61	65	66
62	63	62	62	62	62	63	66	65
57	56	56	57	59	61	63	64	64
58	57	55	54	53	54	55	59	61
51	49	48	46	47	50	54	55	57
63	62	61	58	57	56	58	59	61
56	53	54	54	56	56	56	59	59

12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00
86	88	89	90	91	89	88	87	86
88	89	87	89	88	87	85	83	78
88	90	90	91	87	88	86	86	83
89	83	88	86	82	69	77	75	76
83	83	84	86	87	87	89	83	81
88	90	92	81	77	77	78	77	77
86	89	90	91	73	71	73	75	76
85	86	89	88	88	86	87	85	83
91	91	94	92	82	70	72	73	72
85	86	87	88	88	89	87	85	83
89	91	90	91	90	90	89	87	84
88	90	90	92	89	89	89	86	84
88	89	89	90	90	91	88	86	84
86	88	88	90	87	87	86	83	80
87	89	90	91	91	91	90	88	86
84	86	89	89	90	88	88	86	83
86	87	90	90	91	90	88	87	83
86	86	88	89	88	88	86	84	79
87	89	90	89	89	89	81	81	79
85	87	88	88	89	90	86	86	85
85	87	89	86	85	76	71	72	73
83	85	87	88	88	87	86	83	81
82	85	86	87	87	88	86	83	80
85	85	87	88	87	86	85	82	78
83	82	86	88	85	82	80	78	73
84	86	87	85	69	71	73	72	71
77	78	81	84	87	85	83	82	79
85	87	84	79	76	75	76	75	73
84	85	86	85	87	85	85	82	78
84	84	83	85	85	86	84	83	80
82	84	83	86	84	85	81	82	80
78	80	80	84	84	84	84	86	80
81	84	85	86	85	84	83	81	76
81	82	85	79	75	75	74	73	73
84	85	82	81	79	77	74	72	71
81	80	83	83	85	83	81	81	79
82	82	82	84	84	83	85	82	82
78	79	81	83	84	85	82	80	86
78	81	82	83	84	83	81	75	72
80	80	83	84	76	74	77	77	75
78	80	82	83	83	84	83	83	82
82	84	83	82	82	84	84	82	81
79	80	81	83	83	84	82	81	79
78	81	81	81	82	82	83	81	76
78	81	83	77	76	74	76	77	77
79	82	80	83	82	81	80	79	76
79	83	72	73	72	73	72	70	68
75	77	80	80	83	82	80	80	78
78	81	81	83	82	82	82	80	79
81	83	81	81	81	81	80	78	75
82	80	80	80	78	81	81	74	73

80	79	79	82	80	77	77	77	76
82	80	80	79	78	78	75	75	75
78	79	79	80	81	79	77	76	73
69	70	71	72	73	73	73	72	70
73	75	78	78	80	77	77	75	74
73	74	78	80	79	79	78	76	75
76	74	77	79	80	78	77	75	76
77	78	78	79	80	79	78	78	75
76	77	78	79	79	80	78	77	75
74	76	75	74	77	78	79	75	72
75	77	77	78	78	79	77	76	72
74	76	77	78	77	79	77	74	73
75	76	77	78	76	75	73	69	67
71	73	75	76	77	78	76	70	66
75	77	77	78	75	72	72	72	71
72	74	74	78	73	73	72	72	69
75	75	76	76	75	77	75	72	70
77	74	73	74	73	74	75	74	72
72	73	74	74	74	75	77	73	73
75	74	76	75	74	73	73	71	70
73	76	73	71	71	69	68	68	68
64	64	69	72	73	75	72	69	65
73	74	75	74	75	74	71	70	67
71	73	73	73	74	75	73	71	68
71	74	72	70	66	61	60	60	60
72	71	68	68	68	66	63	62	62
70	72	72	73	70	69	66	63	62
67	69	70	70	71	69	68	65	63
68	69	71	70	70	66	69	70	71
71	63	64	65	64	64	65	64	64
64	66	66	70	70	70	68	67	65
63	64	66	67	69	66	63	61	59
60	62	64	64	67	65	62	60	59
61	62	64	64	60	60	59	55	52
60	60	64	62	58	55	54	55	54

21:00	22:00	23:00	24:00:00
85	84	82	82
76	72	71	69
82	74	74	74
76	76	75	75
78	76	74	76
77	76	76	75
74	74	74	73
79	78	76	73
73	71	71	71
81	81	75	73
83	82	77	76
83	80	77	77
83	82	80	80
77	76	76	74
85	83	82	82
75	75	72	72
79	77	77	76
77	73	74	73
77	77	78	77
83	83	81	80
74	74	73	71
81	81	80	75
79	78	77	75
76	74	73	73
75	77	76	75
71	71	71	72
79	79	78	78
73	73	73	73
74	72	71	69
78	77	76	75
77	73	71	70
78	73	74	74
74	71	70	70
72	72	70	64
70	69	69	69
78	77	75	75
71	72	71	71
68	66	67	66
72	70	68	66
76	75	73	71
79	79	79	78
78	76	76	76
76	75	74	73
73	72	71	70
76	77	77	76
75	74	74	68
66	65	65	64
76	73	73	74
77	76	71	70
71	69	68	66
75	74	75	75

74	75	74	72
74	73	73	70
72	71	67	69
66	67	62	64
73	71	70	69
74	73	72	73
75	75	75	74
73	72	66	64
73	70	68	66
71	71	71	72
70	68	64	64
71	70	69	68
66	67	66	65
64	63	63	63
71	70	71	71
66	63	65	62
69	68	69	64
72	69	66	67
71	69	68	66
69	68	68	63
66	65	66	65
61	59	55	56
64	64	64	63
66	65	64	63
59	58	56	55
61	60	60	59
61	61	59	55
61	59	57	55
70	71	71	71
64	62	61	60
64	63	63	62
60	57	57	56
60	59	55	55
52	50	48	47
52	51	49	49

ICC Docket No. 07-0540

**Commonwealth Edison Company's Response to
CUB's (CUB) Data Requests 1.02 – 1.23
Dated: November 21, 2007**

REQUEST NO. CUB 1.13:

Provide all documents, studies and work papers supporting the statement "[c]alling the program unnecessarily during the summer would drive up the marginal costs of the program." ComEd Ex. 3.0 lines 201-202.

RESPONSE:

Person responsible for response

James Eber, Commonwealth Edison Company

No specific documents have been created evaluating the impact of how calling Nature First unnecessarily would increase the marginal costs of the program.

ICC Docket No. 07-0540

Commonwealth Edison Company's Response to
CUB's (CUB) Data Requests 1.02 – 1.23
Dated: November 21, 2007

REQUEST NO. CUB 1.15:

Provide all documents, studies and work papers supporting the statement "[i]t is likely that increasing the number of times the Nature First Program participants are called during a summer would decrease customers' willingness to participate in the program for the amount of incentive currently provided and increase the churn rate of program participants." ComEd Ex. 3.0, lines 202-205.

RESPONSE:

Person responsible for response

James Eber, Commonwealth Edison Company

No specific documents have been created evaluating the impact of how "[i]t is likely that increasing the number of times the Nature First Program participants are called during a summer would decrease customers' willingness to participate in the program for the amount of incentive currently provided and increase the churn rate of program participants."